

“GREENING” HOSPITALS

AN ANALYSIS OF POLLUTION PREVENTION IN AMERICA’S TOP HOSPITALS



HEALTH CARE
WITHOUT
HARM
THE CAMPAIGN FOR
ENVIRONMENTALLY
RESPONSIBLE
HEALTH CARE



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Contents

EXECUTIVE SUMMARY	1
CHAPTER 1. INTRODUCTION	5
CHAPTER 2. MEDICAL WASTE TREATMENT	9
CHAPTER 3. MOUNTAINS OF MEDWASTE	23
CHAPTER 4. CONCLUSIONS	31
APPENDIX A. SAMPLE SURVEY	32
APPENDIX B. HEALTH CARE WITHOUT HARM MEMBER ORGANIZATIONS	37

Executive Summary

Lack of basic environmental practices at major U.S. hospitals is resulting in serious pollution problems and contamination of major foods, including baby foods. A first of its kind environmental survey of 50 major U.S. hospitals uncovered widespread failure on the part of medical facilities to take steps to halt contamination of milk, meats and fish by dioxins and mercury, pollutants that cause a wide range of health impacts.

Federal studies have documented that incineration of millions of pounds of hospital waste each year constitutes a major source of both of these pollutants, as well as other environmental contaminants. A *Consumer Reports* laboratory study in June, 1998 found dioxin in processed meat baby food products at levels 100 times higher than the government’s current daily limit for this extraordinarily potent carcinogen and hormone disrupting pollutant. A December, 1997 government study estimated that 1.6 million pregnant women and women of child-bearing age are potentially exposed each year to unsafe levels

of neurotoxic mercury from fish alone, including canned tuna. Thirty-nine (39) state departments of health have issued fish consumption warnings due to mercury contamination.

“Greening” Hospitals finds that the health care industry has begun to change some of these practices. Many of the dirtiest and largest on-site hospital incinerators have been shut down. A growing number of hospitals has pledged to reduce toxic emissions, reduce their waste stream, and purchase products that prevent pollution from dioxins, mercury and other toxic materials. But our analysis of survey results makes clear that often the policies and goals that have been set on paper are not reflected in the actual practices of hospitals. The health care industry has a lot of work to do before it can fulfill the medical oath to “first do no harm.”

This study draws on survey results obtained from 50 of the nation’s top hospitals, derived from the list of the top 135 hospitals in the nation compiled by *U.S. News and World Report*.

A growing number of hospitals have pledged to reduce toxic emissions of mercury and dioxins, but our survey shows that often these policies and goals are not reflected in actual practice.

The health care industry has a lot of work to do before it can fulfill the medical oath to “first do no harm.”

Of the hospitals that have mercury reduction programs, 37 percent of the hospitals still buy patient thermometers that contain mercury and nearly half buy mercury blood pressure devices.

Over 40 percent of survey respondents continue to incinerate medical waste that should be treated by safer methods.

Only 2 percent of hospital waste needs to be incinerated to protect the public health, yet some hospitals incinerate 75 to 100 percent.

Major Findings

- Just 20 percent of the survey respondents have programs to reduce purchases of PVC plastic, an important source of chlorine for the creation of dioxin in incinerators. Yet even these few PVC reduction initiatives do not seem particularly effective. Only 6 percent of the hospitals surveyed use PVC-free IV Bags and all of the hospitals that claim to have PVC reduction programs use PVC IV bags.
- Nearly 80 percent of the survey respondents say that they have mercury reduction programs, but these programs too, are not yet particularly effective. Of the hospitals that have mercury reduction programs, 37 percent of the hospitals still buy patient thermometers that contain mercury and nearly half buy mercury blood pressure devices.
- Nearly 80 percent have conducted waste audits in the past 3 years and over 90 percent have had annual trainings on how to segregate infectious waste to allow them to incinerate less. Yet, over 40 percent of survey respondents continue to incinerate medical waste that should be treated by safer methods.
- The average hospital is only recycling approximately

one-third of the readily recyclable items. The most number of items recycled was 31; some hospitals recycled none.

- Almost 60 percent of the respondents report buying reusable goods over disposables where feasible, and 46 percent have packaging reduction programs.

Recommendations

There are three ways that hospitals can dramatically reduce the amount that they pollute: avoid incineration (on-site and off-site), eliminate toxic materials in the products they use, and reduce waste overall.

Waste Treatment

The most important thing that a hospital can do to reduce its impact on surrounding communities is to move away from the unnecessary incineration of waste. According to the Centers for Disease Control, only 2 percent of hospital waste needs to be incinerated to protect the public health, yet some hospitals incinerate 75 to 100 percent. This practice is quite costly for the hospital and poses serious, avoidable risks to the environment and human health. Safe and economical alternatives to incineration exist and, although they are not risk-free, they can be combined with an effective waste segregation program to both reduce pollution and cut hospital disposal costs.

Toxics Reduction

While it is important for hospitals to move away from incineration, it is also important to reduce the amount of toxic chemicals that hospitals use. Two of the pollutant sources that are the easiest to replace are mercury-containing devices and PVC plastic.

Mercury

Hospitals can reduce their impacts on surrounding communities by replacing mercury-containing instruments like thermometers and blood pressure cuffs with non-toxic alternatives. They should also educate staff on how to clean up mercury spills and check their sewer lines to ensure that existing mercury does not get into the water supply.

PVC

Polyvinyl Chloride (PVC) plastic has long been suspected as a source of toxic compounds in the environment, particularly dioxin. According to the Minnesota Hospital and Health care Partnership, PVC is thought to be responsible for 45 percent of total dioxin emissions from the health care industry.

Recognizing these dangers, a number of public health and health care organizations have recently passed resolutions calling for the elimination of PVC plastic in the health care industry. These groups include large

professional organizations like the California Medical Association, the Minnesota Hospital and Health care Partnership, and the American Public Health Association.

Hospitals have begun to replace some of their PVC-based products and packaging with non-toxic alternatives like non-chlorinated plastics or metals. Ongoing research into these non-toxic alternatives will make it easier for hospitals to move away from PVC plastic. If more hospitals demand PVC alternatives, health care supply companies will respond.

Waste Reduction

The health care industry in the United States generates a huge amount of solid waste. In fact, hospitals alone produce approximately 2 million tons of waste per year, a figure that has more than doubled since 1955. The public pays for this waste through the loss of landfill space and pollution associated with production and disposal of products that become trash. Hospitals pay in the form of ever higher disposal costs.

The first step in reducing the amount of waste sent to landfills and incinerators is to conduct a waste audit to find out where the trash is being created and what types come from different areas. The second step is to reduce the amount of waste generated by developing packaging reduction programs with vendors

Two of the pollutants that are the easiest to replace are mercury-containing devices and PVC plastic.

Hospitals alone produce approximately 2 million tons of waste per year.

and replacing disposable products with reusables. The third step is to design a recycling program to manage the remaining waste in an environmentally-responsible way.

The Health Care Without Harm coalition consists of a broad array of organizations

concerned about the impacts of the health care industry on the environment and human health. The coalition includes major public health groups, organizations representing health care professionals, hospitals, community and environmental organizations.

Introduction

“First, do no harm” is the credo of the health care professional. The very nature of their work requires health care professionals to err on the side of safety when it comes to the well-being of the patients they serve. This must include special care to eliminate any environmental health problems that medical care facilities, particularly hospitals, may cause.

Ironically, many hospitals pollute the environment with highly toxic substances that actually contribute to public health problems. Of particular concern is the long-standing overuse of incineration for the treatment of medical waste and continued use and improper disposal of hazardous chemicals.

The premise of this report is that the health care industry can and should be much more environmentally responsible and consider the effects of all of its actions on human and ecosystem health. This precept, commonly called The Precautionary Principle, has not been translated well to the environmental practices of these hospitals to date. An environmentally responsible hospital uses the few-

est resources possible and emits the smallest number of toxics necessary to carry out its public health mission.

Hospitals can demonstrate their environmental responsibility in three broad ways: eliminating toxic products, reducing waste, and choosing environmentally sound disposal technologies. In all three of these areas, responsible hospitals have learned that doing the ecologically correct thing is often the economically correct thing as well.

National Rankings

Each year, *U.S. News and World Report* conducts a survey of the 6,000 hospitals in the United States and ranks them according to reputation, predicted mortality and the availability of certain technologies and services (Comarow 1997). The final rankings are also broken down by specialty such as cancer centers or children’s hospitals. Consumers use the results as a resource to make educated choices about their health care needs.

The Health Care Without Harm Coalition used the U.S. News ranking as a basis for our

Many hospitals pollute the environment with highly toxic substances that actually contribute to public health problems.

The health care industry can and should be much more environmentally responsible.

Table 1. Hospitals that were included in this study.

Hospital Name	City	State
University Hospital of Arkansas	Little Rock	AR
Loma Linda University	Loma Linda	CA
LA County-USC	Los Angeles	CA
UCLA Medical Center	Los Angeles	CA
UC Davis Medical Center	Sacramento	CA
San Francisco General	San Francisco	CA
Stanford University Hospital	Stanford	CA
National Jewish Medical Center	Denver	CO
University Hospital	Denver	CO
Children's National Hospital	Washington	DC
Medical Center of Delaware	Wilmington	DE
Shands Hospital	Gainesville	FL
* University of Iowa Hospitals and Clinics	Iowa City	IA
Macneal Hospital	Berwyn	IL
Cook County Hospital	Chicago	IL
University of Chicago	Chicago	IL
University of Illinois	Chicago	IL
Beth Israel Deaconess Medical Center	Boston	MA
Brigham & Women's Hospital	Boston	MA
Dana Farber Cancer Institute	Boston	MA
Massachusetts General	Boston	MA
Spaulding Hospital	Boston	MA
* University of Maryland	Baltimore	MD
Greater Baltimore Medical Center	Baltimore	MD
Johns Hopkins University	Baltimore	MD
University of Michigan	Ann Arbor	MI
William Beaumont, Royal Oak	Detroit	MI
Fairview - University	Fairview	MN
Hennepin County Medical Center	Minneapolis	MN
Barnes Hospital	Saint Louis	MO
Saint Louis Children's Hospital	Saint Louis	MO
University of North Carolina Medical Center	Chapel Hill	NC
* Duke University Medical Center	Durham	NC
North Carolina Baptist	Winston-Salem	NC
Dartmouth-Hitchcock Medical Center	Hanover	NH
Albany Medical Center	Albany	NY
Beth Israel Medical Center	Manhattan	NY
Manhattan Eye, Ear & Throat Clinic	Manhattan	NY
Mount Sinai Medical Center	Manhattan	NY
Long Island Jewish Medical Center	New Hyde Park	NY
Strong Memorial	Rochester	NY
* University Hospital	Cincinnati	OH
Mount Sinai	Cleveland	OH
University Hospital	Portland	OR
Lehigh Valley Hospital	Allentown	PA
Hospital of the University of Pennsylvania	Philadelphia	PA
Allegheny General Hospital	Pittsburgh	PA
Rhode Island Hospital	Providence	RI
Medical University of South Carolina	Charleston	SC
Vanderbilt University Hospital and Clinic	Nashville	TN
Anderson Cancer Center	Houston	TX
University of Virginia	Charlottesville	VA
Fairfax	Falls Church	VA
University of Washington Medical Center	Seattle	WA

* - Survey from hospital was not received in time to include it in the national statistics

survey of the environmental practices of the nations leading hospitals. We were able to locate contact information for approximately 100 of the top hospitals and received responses from 54 (Table 1), including 12 of the 16 top hospitals on *U.S. News* ‘ “Honor Roll” .¹

Although we received responses to approximately half of the surveys—a good response rate in survey research—we were unable to ascertain why the rest of the hospitals did not respond. Hospitals that were proud of their environmental record had more of an incentive to respond to our survey than those that may have found their practices lacking. Our results may therefore overestimate the extent of environmental stewardship America’s top hospitals. Future research should be able to build upon this study and correct for potential biases.

Survey Results

The responses to our survey were mixed, with few hospitals at either the “green” or the “brown” end of the spectrum. Overall, we found:

- Over 40 percent of the hospitals surveyed still incinerate infectious waste that could be treated by safer methods such as autoclaving.
- 80 percent have programs in place to reduce mercury use; however, nearly 50

percent still purchase mercury-containing thermometers and over 50 percent still purchase mercury blood pressure cuffs, two of the easiest products to replace with devices that serve the same purpose but do not contain mercury.

- just 20 percent have programs to reduce purchases of PVC plastic; only 4 percent use PVC-free IV Bags.
- 80 percent have conducted a waste audit in the past 3 years

- The number of recycled items varied from 0 to 31 with a mean of 12 items per hospital.
- 58 percent buy reusable goods over disposables where feasible and 48 percent have packaging reduction programs.
- 92 percent have annual trainings on how to segregate infectious waste from non-infectious waste—the first step in managing hospital waste to reduce impacts on the environment and public health.

Just 20 percent of the hospitals responding to our survey have programs to reduce purchases of PVC plastic; only 4 percent use PVC-free IV Bags.

Note

¹ Unfortunately, surveys from 4 of these hospitals arrived after we had tabulated the national statistics and we were unable to include them in the national analysis.

Medical Waste Treatment

Only about 10 to 15 percent of hospital waste is properly described as “infectious waste.” The rest is solid waste made up of paper and paper board, plastics, food waste, metal, glass, wood and other materials (see sidebar). According to the Society for Hospital Epidemiology of America, “Household waste contains more microorganisms with pathogenic potential on average than medical waste.” (Rutala and Mayhall 1992). Even less of this waste, 2 percent or less of a typical hospital’s waste stream, must be incinerated to protect public health and safety, according to the Centers for Disease Control. Yet some hospitals incinerate 75-100 percent of their waste (Rutala and Mayhall 1992). Incineration increases the amount of toxic effluent coming out of and costs hospitals a great deal of money.

Two of the most important things that a hospital can do to reduce its environmental impact are to:

- segregate its waste for appropriate reuse, recycling, or disposal and;

- move away from incineration as a treatment technology.

Waste Segregation

One of the best ways to reduce the amount of waste that needs to be sent to incinerators, autoclaves, or other medical waste treatment facilities is to keep non-infectious wastes out of the infectious waste stream. In the past, hospitals commonly placed “red-bag” trash bins in all the patient care areas and placed any waste that came into contact with a patient in these bags. This practice not only wasted a great deal of money—infectious waste costs 5 times more to dispose of than regular trash—but was also responsible for the generation of large amounts of toxic pollution when this waste was treated. Now, however, hospitals like New York’s Beth Israel Medical Center have begun to segregate infectious waste from non-infectious waste (see sidebar). These hospitals have discovered that the best ways to keep non-infectious waste out of these red bags is to educate hospital employees as to what the definition of “in-

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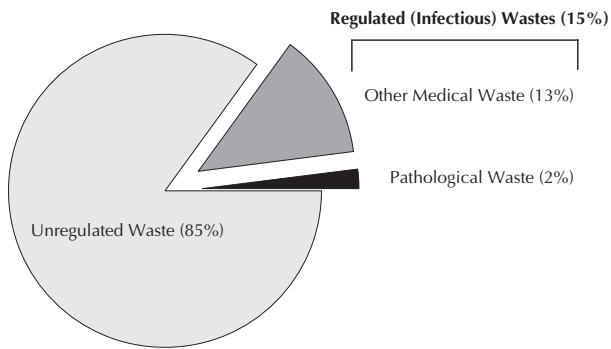
Only 2 percent or less of a typical hospital’s waste stream, must be incinerated to protect public health and safety, according to the Centers for Disease Control.

Infectious waste costs 5 times more to dispose of than regular trash.

MOST HOSPITAL WASTE IS NOT INFECTIOUS

Hospital Waste: All waste discarded by hospitals, nursing homes or other health care facilities that is not recycled or otherwise re-used. Includes disposable food service items, office waste, as well as medical waste which includes infectious and pathological waste.

Most hospital waste is like household waste.



Source: Environmental Working Group. Based on Rutala and Mayhall 1992 and personal Communications with Hollie Shaner, Fletcher Allen Health Care, VT; and Laura Brannon, Dartmouth Hitchcock Medical Center.

Adapted from Leach Bisson, et al. 1993.

Medical Waste: Waste generated while actually diagnosing or treating a patient. Includes IV bags, gauze dressings, syringes, and bed pans as well as infectious waste.

Infectious Waste: The portion of medical waste that can transmit an infectious disease. Generally believed to be 15% or less of hospital waste. Disposed of in “red bags” so that it may be more easily identified, most of this waste does not need to be incinerated.

Pathological Waste: Tissues and organs. This is the only fraction of waste that must be incinerated according to the Center for Disease Control (Rutala and Mayhall 1992.) Two hospitals report this comprising only 2% of total waste¹.

fectious” waste really is and then to strategically place “red bag” garbage cans to discourage employees and visitors from putting regular trash in the infectious waste stream.

Most of the hospitals that responded to our survey (90 percent) provide annual education on waste management for employees. These sessions could include everything from recycling to housekeeping but usually contain a section on how to deter-

mine if waste is infectious and needs to be placed in a red bag. In fact, only one of the facilities in our survey offers annual waste management training for employees but does not include a section on red bag segregation in those sessions.

Incineration of Medical Waste

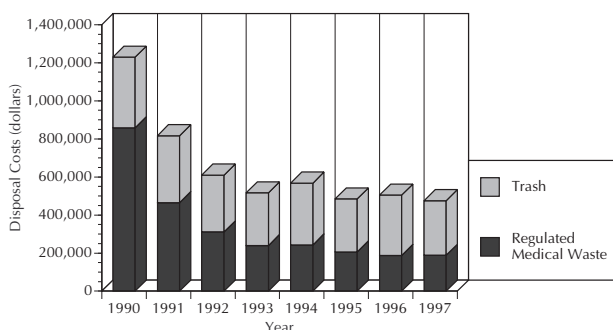
Medical waste incinerators are among the top industrial sources of both dioxin and mercury contamination of the environment.

REDUCING WASTES AND CUTTING COSTS: THE BETH ISRAEL MEDICAL CENTER

After the passage of the federal Medical Waste Tracking Act in 1989, hospitals like New York's Beth Israel Medical Center started to treat all waste that had come into contact with patients as Regulated Medical Waste (RMW). Although this policy kept the facilities on the safe side of the law, the cost of managing medical waste skyrocketed. Beth Israel, for example, had to pay an extra \$1.7 million to package and ship all the excess non-regulated waste. The medical center's administration struggled to meet these costs, and responded by hiring Waste-Tech, a consulting firm, to design a red bag segregation program. Working for the consulting firm and then later as Beth Israel's waste manager, Janet Brown designed an employee education program that included stickers on trash bins, signs, and one-on-one meetings with employees who didn't understand the program. This education, combined with a rigorous monitoring system and strategic placement of waste bins, reduced dramatically the amount of red bag waste at Beth Israel (see

figure). Current estimates suggest that the hospital has saved over 600,000 dollars per year on medical waste disposal costs and over 900,000 on all trash as a result of this program. Even in their smaller facilities, Beth Israel has realized significant savings in disposal costs through good waste management practices. Waste segregation programs like Beth Israel's prove that hospitals can stay in line with current regulations while reducing waste management costs.

Beth Israel Hospital cuts medical waste disposal costs by 60 percent.



Source: Brown, Janet 1993. "Hospital Waste management that Saves Money—and Helps the Environment and Improves Safety." *Medical Waste: The Environmental Publication for the Health-care Industry*. 1(10), July 1993, and Personal Communication, Janet Brown.

Contact: Janet Brown, Beth Israel Medical Center: 212-420-2442

Even though the final EPA medical waste incineration rule was disappointingly weak, our survey suggests that it may be beginning to affect the way that hospitals manage their medical waste.

The Health Care Without Harm Coalition recognizes the Centers for Disease Control's recommendation of incineration for the treatment of pathologic waste (body parts and body fluids) and chemotherapy waste, but opposes its use for the other 98 percent of the medical waste stream.

Both of these chemicals have long-lasting impacts. For many years, emissions from medical waste incinerators were completely unregulated by the federal government and most of the nation's thousands of medical waste incinerators did not employ any pollution control techniques. In recent years, on-site incineration has decreased markedly, though over 2,000 incinerators remain in operation according to the EPA (MRI 1996).

EPA Rules Fail to Protect Health

In 1995—under threat of court order—the EPA proposed fairly stringent rules to protect the public health and limit pollutants from these incinerators. In late 1996, however, the agency weakened the initial comparatively stringent emission standards. According to an analysis by the Natural Resources Defense Council, the EPA's final rule set a pollutant ceiling that is orders of magnitude higher than it should have been (NRDC 1996). The final rule still allows thousands of pounds of mercury and dangerous levels of dioxin to spew into the environment.

Even though the final EPA rule was disappointingly weak, our survey suggests that it may be beginning to affect the way that hospitals manage their medical waste. Rather than paying to upgrade sub-standard incinerators, some hospitals have opted to invest in low-cost alternative treatment methods. This shift, in turn, has begun to alter the economics

of waste treatment, lowering the cost of non-incineration-based treatment.

Alternatives

The Health Care Without Harm Coalition recognizes the Centers for Disease Control's recommendation of incineration for the treatment of pathologic waste (body parts and body fluids) and chemotherapy waste, but opposes its use for the other 98 percent of the medical waste stream. Affordable and effective alternatives exist that can treat this waste in a much more environmentally responsible way. Three frequently used alternatives are:

- **Autoclaves**, the most popular of the alternatives, are similar to high technology dishwashers that rely on increased temperature and pressure to destroy infectious agents (MRI 1996). In contrast to incineration, however, the material is not combusted, thus reducing the risk of dioxin production. There are some occupational risks associated with autoclaving; however, worker training can significantly manage these risks (MRI 1996). There is also a risk of mercury entering water bodies around the autoclaving facility if proper precautions are not taken. While autoclave use is not risk free, overall environmental risks are far less

severe than those associated with incineration (MRI 1996).

- **Microwaves** use radiant energy to heat water that is sprayed onto waste. Once the water reaches its boiling point, it boils the infectious microbes, rendering most of them harmless. In a study done for EPA (MRI 1996), microwaves were shown to disinfect but not completely sterilize medical waste. Some of the most heat-resistant bacteria are not inactivated. Since the technology has been judged to be effective, many states' standards would permit microwave disinfection even when low levels of heat-resistant bacteria persist (MRI 1996).
- **Chemical Treatment** relies on the grinding of medical waste with certain chemicals to sterilize the waste. Once treated, the ground up waste can be sent to a landfill or a recycling operation and the used chemicals can be sent to a chemical waste treatment facility for disposal.

Chemical treatment generally does not perform as well as either microwaving or autoclaving and the chemicals involved may pose risks to workers and the environment.

Although the use of alternative treatment technologies has historically been rejected for cost reasons, moving away from incineration does not have to be a costly change. In some instances, hospitals have found that they could save money by switching from an incineration-based treatment program to an alternative like autoclaving or microwaving. In other cases, the hospitals have made up the cost difference through changes in their procurement and waste reduction programs. In an EPA survey of hospitals that use alternative on-site waste treatment, including autoclaves, microwaves, and chemical treatment, seven out of eight hospitals reported saving money compared to on-site incineration. The one hospital that did not report savings was comparing the alternative to an incinerator that was uncontrolled, which would not be allowable, even under EPA's weak 1997 rule (MRI 1996).

In an EPA survey of hospitals that use alternative on-site waste treatment, seven out of eight hospitals reported saving money compared to on-site incineration.

NAPLES COMMUNITY HOSPITAL IN FLORIDA SHUTS DOWN INCINERATOR

Frequent malfunctions and community concerns led the Naples Community Hospital to shut down its incinerator and switch to autoclaving. The technology shift made economic sense and was the appropriate response from a community relations standpoint. Operating costs for waste disposal dropped more than 80 percent, from 24 cents to only 4 cents per pound.

Source: Environment Reporter Vol. 27 p. 1443-4. November, 1996.

COMMUNITY STRUGGLE MAKES GOOD NEIGHBORS

When the Charleston Area Medical Center (CAMC) in West Virginia decided to build a medical waste incinerator in 1996, it could not have known the uproar that this decision would spark. Outraged by the dioxin hazard posed by planned incinerator as well as the fact that the hospital was planning on burning both infectious and non-infectious waste, local community and environmental groups brought a lawsuit against the hospital to block construction. The suit was settled in early 1997 when the hospital agreed to implement a waste reduction and segregation plan and to limit carefully the waste that it incinerates. The hospital also agreed to reevaluate periodically the opportunity to switch to an alternate treatment method like autoclaving.

The results of this compromise have been spectacular from the hospital's viewpoint. In a March, 1998 press conference, CAMC officials announced:

CAMC reduced the amount of medical waste incinerated from 1.6 to 1.3 million pounds in one year.

The hospital recycled more than 1 million pounds of trash, including 600,000 pounds of cardboard and saved more than \$22,000. All of this trash would have been incinerated and the ash would have needed to have been disposed of if the hospital was not required to recycle.

Lillian Morris, CAMC's safety director, attributes these marked savings to increased sensitivity to waste issues on the part of the hospital staff and the implementation of a waste segregation program.

The Charleston Area Medical Center example shows how community groups, working with hospitals, can design solutions to environmental problems that are both good for the community and the hospital's bottom line.

Source: Ward, Ken. "Good Neighbors on East End: By Meeting Waste-Burning Goals, CAMC Pleases Residents." *Charleston Gazette*. 10 March 1998.

Survey Results

The good news is that many hospitals are moving away from incineration as the primary method of waste treatment; however, over 40 percent still incinerate infectious waste that could be treated by safer methods. Many hospitals send far too much un-segregated medical waste to off-

site incinerators for burning. The hospitals that responded to the Health Care Without Harm survey were distributed along the following range, from least to most responsible:

- 3 hospitals burned non-infectious waste in either on-site or off-site medical waste incinerators

- 18 hospitals did not burn non-infectious waste but relied solely on waste incinerators to treat their infectious waste. These hospitals incinerated more than the CDC suggests is necessary to protect the public health.
- 29 hospitals used incineration in concert with safer treatment methods like autoclaves to treat their waste.

Of the hospitals that said that they use either on-site or off-site incineration, 82 percent only use off-site incineration, 8 percent only use on-site, and 10 percent use a combination of the two. Although off-site incinerators often have better pollution control methods than on-site ones, medical waste incineration of any kind leads to the release of dioxins and mercury into the environment. It is encouraging to see that most hospitals have moved away from the incineration of all of their infectious waste and that almost all have stopped incinerating non-infectious waste; however, over 40 percent of the hospitals surveyed still rely too heavily on incineration as a waste treatment method.

The 1997 EPA regulations for incinerators seem to have had mixed effects on waste treatment practices. Although all 6 hospitals that rely on on-site incineration are reconsidering their waste disposal options, only ap-

proximately one-third of hospitals that rely on off-site incineration are considering switching to alternative disposal methods.

The Toxic Threat

In addition to avoiding unnecessary incineration of waste, there are a number of other steps that hospitals can take to reduce their negative impact on the environment. Hospitals need to examine the materials that they use and their toxic effects. Many of the toxic items in use in hospitals are easily replaceable with non-toxic alternatives. The easiest products to start with are mercury-containing instruments and PVC plastic.

Mercury

Mercury is a persistent, bio-accumulative toxin that has been linked to numerous health effects in wildlife and humans. Its natural state under ambient temperature is a silver-white liquid that changes easily from solid to liquid to gas, allowing it to circulate in the atmosphere and the environment. There are three major forms of mercury that circulate in the atmosphere but the one of most concern for humans and wildlife is methylmercury. Methylmercury is formed by bacteria from inorganic mercury and is the most harmful because, unlike the other forms of mercury, it is absorbed by the muscle tissue and can build up in the food chain.

Mercury is a potent neurotoxin, which means it attacks the body's central nervous system; it can also

Many hospitals send far too much unsegregated medical waste to off-site incinerators for burning.

Medical waste incineration of any kind leads to the release of dioxins and mercury into the environment.

DIOXIN: A UNIQUE KILLER

Although actually consisting of a class of chemicals, "Dioxin" commonly refers to one particular chemical, 2,3,7,8-TCDD. Dioxin has no commercial use. It is a toxic by-product formed when waste containing organic material and a chlorine source are burned and when other organic chemicals that contain chlorine are manufactured.

Two aspects of dioxin's toxicity are particularly important from a public health perspective: the wide variety of harmful health effects it produces, and the extremely low levels of exposure that produce these effects. Peer-reviewed research has documented that dioxin causes cancer, affects the immune system, causes birth defects—including fetal death—decreases fertility, causes female and male reproductive dysfunction, and affects a variety of hormonal processes involving insulin, thyroid hormones, and steroid hormones (EPA 1994c). In February, 1997, a group of 25 scientists from 11 countries, convened by the prestigious International Agency for Research on Cancer (IARC), classified dioxin (2,3,7,8-TCDD) as a proven human carcinogen. No other chemical is known to cause such a wide variety of effects.

Dioxin's other unique feature is its astonishing potency. Dioxins, especially 2,3,7,8-TCDD, are toxic in doses almost too low to measure. There may be no safe level of dioxin and it clearly takes only a minuscule amount to cause alarming adverse effects. In 1994, EPA's acceptable daily exposure was 0.006 picograms/kg/day. This level is equivalent to a drop of dioxin in 600,000 railroad cars of water. More recent estimates report that 0.01 picograms/kg/day (EPA 1997) is an acceptable amount. EPA's current draft of the dioxin reassessment shows that while *this* level may be acceptable, humans routinely and inadvertently consume 300 to 600 times this amount every day (see also DiVito et al. 1995).

Dioxin is highly persistent in the environment. Chlorine bonds in the molecule are extremely resistant to chemical or physical breakdown, making environmental degradation almost non-existent. As a result, dioxin is ubiquitous in our food and water supply and is indeed accumulating in the environment and in the human population. Many states and municipalities have posted fish advisories due to dioxin contamination of finfish and shellfish. Despite restrictions and warnings, people still consume dioxin-contaminated fish, a particularly worrisome risk to families who subsist on fish.

The primary route of dioxin exposure for humans is through consumption of dairy and beef products. Dioxin concentrates in the fat and fatty products of these animals after they consume grass or hay that is contaminated when dioxin emitted from incinerators is deposited on pasture land or hay fields. Humans may also consume dioxins through other foods, including pork, chicken, and eggs. There is no way for farmers and fishers to keep dioxin compounds from contaminating the animals they raise. Even those who farm or fish far from the nearest medical incinerator are at risk because of dioxin's ability to travel long distances.

Once dioxin is consumed, the human body processes it very slowly, producing a build-up of the chemical in our systems. This is referred to as the "body burden." Because dioxin is so pervasive in the food supply, the average person in the United States is already contaminated with an average body burden of 9 pg/g (EPA 1994c). One pg/g is one part per trillion, a unit so small that it is rarely used to express toxicity except in dealing with dioxins. Studies show that it takes as little as 14 pg/g to cause effects such as altering glucose tolerance (EPA 1994c). Decreased testosterone levels have been documented at levels as low as 44-122 pg/g (DeVito et al. 1995).

Most alarmingly, dioxin's tendency to concentrate in fat means that it is a common ingredient in breast milk, ensuring that the most sensitive members of the population, newborns, begin life with an unhealthy dose of the toxin. Nursing infants take in 50 times the amount of dioxins that adults take in daily (EPA 1997). In just 6 months of breast feeding, a baby in the United States will, on average, consume EPA's recommended maximum lifetime dose of dioxin (Colborn, et al. 1996).

Dioxin is also a long-distance contaminant. Studies have shown that dioxin can be transported across whole continents. A recent study by the Center for the Biology of Natural Systems predicted that dioxin emitted, for example, by medical waste incinerators in Texas and Florida are a significant source of contamination to the Great Lakes (CBNS 1995). Another researcher reported that other toxic chemicals have been found in the Canadian Arctic just days after their release in China and Russia (Bidelman 1996). This long-range transport phenomenon and the fact that dioxins in the human body can not be "cleaned up", makes it the prevention of further dioxin release an issue of critical importance.

Infants are at special risk of brain damage from mercury exposure.

39 state departments of health in the United States have issued over 1,600 warnings against eating mercury contaminated fish caught in certain waters from that state.

1.6 million pregnant women, children, and women of child-bearing age are exposed to unsafe levels of mercury from fish alone, according to the EPA

Of the estimated 158 tons of mercury emitted annually into the atmosphere, 10 percent comes from the incineration of medical waste.

harm the brain, kidneys and lungs. The blood-brain barrier, which restricts the penetration of toxics to the brain, is not fully developed in humans until about one year of age, so young infants are at special risk of brain damage from mercury exposure. Mercury can also cross the placenta in pregnant women and damage the developing fetus. Studies done on women who ate methylmercury-contaminated fish or grain showed that even when the mothers showed few effects of exposure, their infants demonstrated nervous-system damage. For this reason, 39 state departments of health in the United States have issued over 1,600 warnings against eating mercury-contaminated fish caught in certain waters from that state. Nine of those states: Connecticut, Florida, Indiana, Massachusetts, Maine, Michigan, New Hampshire, New Jersey, and Vermont have statewide restrictions or prohibitions on fish consumption due to mercury contamination (EPA 1997a). Even with these restrictions and warnings, however, 1.6 million pregnant women, children, and women of child-bearing age are exposed to unsafe levels of mercury from fish alone, according to the EPA (EPA 1997a).

Since mercury is used in chemical solutions throughout hospitals and in thermometers, blood pressure gauges, batteries, and fluorescent lamps, these facilities are large contributors to overall mercury emission. In fact, hospital waste is thought to

be responsible for one-fifth of the mercury in the solid waste stream (NJDEP 1993). When this waste is burned, the mercury is released into the atmosphere and gradually spread to surrounding communities. Of the estimated 158 tons of mercury emitted annually into the atmosphere by anthropogenic sources, 10 percent comes from the incineration of medical waste (USEPA 1997).

Ways to Eliminate Mercury Use

Many opportunities exist to reduce loadings of mercury into the environment and ultimately into humans. Table 2 lists a number of common medical uses for mercury and non-toxic alternatives. It is important that hospitals recognize the need to educate employees on the management of spills and the importance of segregating mercury-contaminated waste. Also, a regular program of inspecting sewer traps and catch basins for mercury can help prevent past releases from contaminating the local community. Ultimately, reducing the use of mercury-containing products will prove to be the most effective means of limiting mercury pollution from the health care industry.

Survey Results

The good news is that most hospitals have realized the dangers inherent in mercury-containing products and have taken steps to eliminate them. Of the hospitals surveyed, 4 out of 5

Table 2. Many mercury-containing products have non-toxic alternatives.

Mercury-Containing Product	Replacement
Thermometers	Geratherm, electronic battery-operated, range, infrared aural, Enviro-safe Immersion
Weighted Esophageal Dilator	Tungsten-weighted dilator
Feeding Tubes	All plastic, tungsten-weighted
Immune Saline with Thimerosal (merthiolate)	Thimerosal-free saline
Mercurochrome	Neosporin, Mycin
Thimerosal	Thimerosal-free bactericides
Dental Amalgams	Non-mercury amalgams
Batteries	Nickel-Cadmium, other rechargeable batteries

Source: *Lourie 1996.*

have programs in place to eliminate the use of mercury containing products in their facility. Most of the hospitals (62 percent) require vendors to disclose the presence of mercury in chemicals that the hospital purchases and only 12 percent of the hospitals distribute mercury-containing thermometers to new parents. Nearly all (92 percent) teach their employees about the health and environmental effects of mercury and 46 percent teach all employees how to clean up mercury spills. These results show that most administrators in top hospitals understand that the benefits of the continued use of mercury are outweighed by its toxic effects and are in the process of eliminating its use.

The bad news is that these mercury reduction policies have not been followed up with actions to make the hospitals mercury free. Indeed, many of the hospitals that responded to our survey—up to 42 percent—did not know if they still purchase certain mercury-containing prod-

ucts in spite of the fact that many of them have mercury reduction programs. Of the hospitals that could say whether they purchase mercury-containing products, 49 percent purchase mercury patient thermometers, 59 percent purchase mercury sphygmomanometers, 44 percent purchase mercury gastrointestinal diagnostic equipment, 64 percent purchase mercury lab thermometers and 54 percent purchase mercury fixatives. In addition, only 28 percent of the hospitals surveyed said that they have had their sewer traps cleaned to remove mercury.

Polyvinyl Chloride

Although polyvinyl chloride (PVC) plastics have long been suspected as a source of toxic compounds in the environment, the dangers that they pose in health care settings have only recently begun to be addressed by the medical profession. PVC plastic is currently a staple in patient care units and is the fastest growing class of synthetic chlori-

The good news is that most hospitals have realized the dangers inherent in mercury-containing products.

The bad news is that these mercury reduction policies have not been followed up with actions to make the hospitals mercury free.

GETTING MERCURY OUT OF THE GREAT LAKES: ST. MARY'S AND BUTTERWORTH HOSPITAL

Many hospitals have discovered that they can reduce the potential for hazardous accidents in their facility by phasing out the use of mercury-containing devices. Two facilities, Butterworth Hospital in Grand Rapids, Michigan and Saint Mary's in Duluth, Minnesota have made commitments to make their hospitals mercury-free.

Butterworth Hospital has made a commitment to be mercury-free and is attempting to reach that goal by instituting a purchasing department policy. This policy states that whenever possible, the hospital must purchase mercury-free products. Hospital administrators have approved a proposal to replace all blood pressure gauges containing mercury with aneroid devices, a mercury-free alternative. The obstetrics department has also ceased sending mercury thermometers home with new mothers.

Butterworth Hospital also hired a local environmental consultant to devise a disposal plan for mercury that would be safe and economical for the entire hospital. The consultant, Stock Environmental, developed a spill response plan in accordance with guidelines from the Occupational Safety and Health Administration and the Joint

Commission Accreditation of Health care Organizations. They also offered training on spill response, prevention and management.

After years of education regarding the dangers of mercury and how Minnesota's lakes and rivers are particularly at risk, St. Mary's Hospital in Duluth began a program to phase out mercury-containing devices. The hospital replaced mercury thermometers with IVAC oral thermometers in early 1991 and then switched to tympanic ear thermometers in July, 1992. Mercury blood pressure units were phased out in May, 1992, and replaced with aneroid air units. The hospital has phased out and nearly eliminated mercury batteries and rubber cantor tubes in the past five years. Finally, the hospital began an aggressive fluorescent bulb recycling program in 1993 to reduce the hazard posed by bulbs that are disposed of improperly.

St. Mary's has successfully reduced the hazard that mercury poses to its staff and to Minnesota's precious lakes and rivers by altering its purchasing policies. Both of these hospitals demonstrate how simple changes in day-to-day operations in hospitals can generate significant benefits for the environment.

Source: Williams, Guy. Mercury Pollution Prevention in Healthcare: A Prescription for Success. Washington, D.C.: National Wildlife Federation, 1997.; Jon Amundson, Personal Communication; and Jamie Harvie, Personal Communication.

Contact: Jamie Harvie, Western Lake Superior Sanitary District: 218-722-3336
Jon Amundson, St. Mary's Hospital: 218-726-4000

nated organic compounds. As a result, a policy to reduce PVC usage in hospitals would have wide-ranging and substantial effects.

There is substantial and growing evidence that PVC contributes to the formation of dioxin from the minute it is produced to the time that it is destroyed. According to the USEPA's recent sources inventory, the exact amount of dioxin created through the production of PVC from ethylene dichloride and vinyl chloride is unknown but it could be between 0.56 to 565 g of toxic equivalents per year (USEPA 1998). This, in addition to the dioxin that is created in the production of the raw materials used to create the PVC, suggests that PVC production could rank among the top sources of dioxin production in the United States.

Since PVC plastic is mostly made up of chlorine atoms and since chlorine is a limiting factor of dioxin formation, PVC is an important chlorine source in medical and municipal waste incinerators. The exact amount of dioxin that comes from a particular incinerator depends on a number of factors including incinerator design, operating conditions, and waste stream segregation.

But, dioxin is only part of the chemical contamination associated with PVC use. Plasticizers called phthalates are often added to the plastic to make it

softer for products like IV bags and tubing. Although this class of chemicals has not been studied very well for health risks, there is evidence that the most commonly used phthalate, Di(2-ethylhexyl)-phthalate (DEHP), could pose health threats in medical settings. DEHP has been classified as a possible human carcinogen by the EPA, has been shown to harm the liver, and are suspected endocrine disrupters in humans and other animals (ATSDR 1989). Phthalates are released to the environment during their production and have been shown to leach out of the plastic when they come into contact with liquids like blood and certain fat-emulsion products. According to the Agency for Toxic Substances and Disease Registry (ATSDR):

Acute exposures to relatively high levels (compared to DEHP levels commonly found in food or drinking water) of DEHP can occur when DEHP migrates from the plastics used in medical apparatus (such as storage bags and tubing) used for blood transfusions or kidney dialysis (ATSDR 1989)

Recognizing the growing evidence regarding the dangers of PVC production and disposal, as well as the availability of alternatives for most of its uses, a number of health organizations have recently passed resolutions calling for the eventual elimination of PVC plastic in the health care industry, including large profes-

A number of health organizations have recently passed resolutions calling for the eventual elimination of PVC plastic in the health care industry, including the California Medical Association, and the American Public Health Association.

PVC is still the plastic of choice in most health care institutions.

The simplest way to eliminate the PVC threat is to use a non-toxic alternative in its place.

Table 3. Many PVC products have non-toxic alternatives.

PVC Product	Alternative
IV bag Vinyl gloves Plasma collection bags Sharps containers	Non-PVC polymer blend (e.g.; by McGaw) Latex, nitrile gloves EVA resin bags Polyethylene containers, reusable containers

Sources: Minnesota Center for Environmental Advocacy, CGH Environmental Strategies.

The health care industry has only recently begun to address the dangers of PVC plastic.

sional organizations like the California Medical Association, the Minnesota Hospital and Health Care Partnership and the American Public Health Association.

Ways to Eliminate the PVC Threat

Although some hospitals have switched to non-toxic alternatives, PVC is still the plastic of choice in most health care institutions. Hospitals use the plastic in a number of devices including IV bags, tubing, endotracheal tubes, oxygen tents, mattress covers and in packaging.

Hospitals that have reduced PVC usage have realized that the simplest way to eliminate the PVC threat is to use a non-toxic alternative in its place. These hospitals have replaced soft PVC items like patient identification bracelets and cards, IV bags, compression stockings and fluid collection devices with non-toxic alternatives. They have also replaced rigid PVC products with alternatives made of metal or non-chlorinated plastics such as polypropylene and polycarbonate. Research into non-toxic alternatives including work being

done to develop new non-chlorinated polymers will make it easier for hospitals to move away from PVC products. This research will certainly gain an extra boost as large hospitals make the environmentally responsible pledge to eliminate PVC from their facilities.

Survey Results

The health care industry has only recently begun to address the dangers of PVC plastic, so it is not surprising that most of the top hospitals do not have programs to reduce its usage. Only 20 percent of the hospitals surveyed have programs in place to minimize the purchasing of these plastics, 4 percent use non-PVC IV bags, and 16 percent have programs to reduce the amount of PVC in containers and packaging. This news is troubling since a large percentage of this PVC is probably incinerated. It is heartening that large medical associations like APHA have taken strong stands in favor of sunsetting the plastic since actions like these should lead to significant decreases in PVC usage in the future.

Most top hospitals do not have programs to reduce its usage.

Mountains of Medwaste

The health care industry in the United States generates a large amount of solid waste. In fact, hospitals alone produce approximately 2 million tons of waste per year, a figure that has more than doubled since 1955 (Figure 1). The public pays for this waste through the loss of landfill space and pollution from the production of this trash. Hospital administrators, no longer able to send their trash to open pits, pay in the form of high disposal costs. These high costs, coupled with an increasing array of regulations regarding treatment and disposal of toxic substances have made waste management one of the top issues facing hospital administrators. The most environmentally responsible hospitals have reacted to this problem by developing a plan for waste reduction and recycling. Less inspired facilities have continued business as usual, relying on expensive medical waste incinerators to dispose of regulated and non-regulated waste.

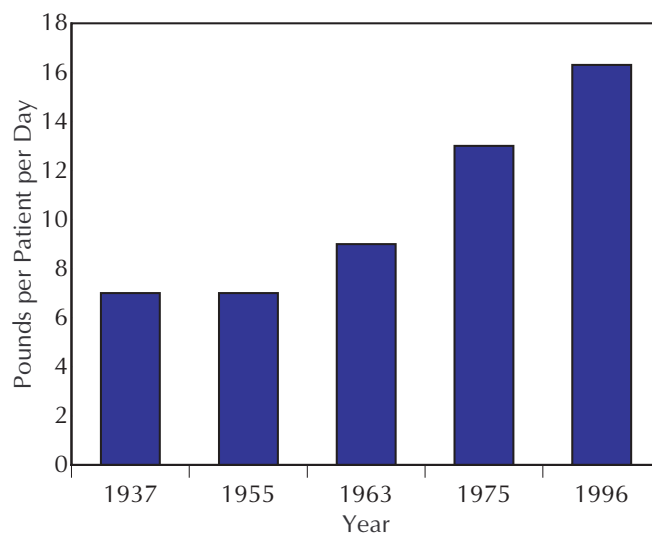
Waste Reduction

If all 2 million tons of waste produced by American hospitals each year was piled on a foot-

ball field, it would reach a height of nearly one mile. This extraordinary mountain of waste could easily overwhelm most hospital managers, so before hospital administrators can control their trash problem, they need to audit their waste stream and learn where most of their trash comes from. This can be done in a quick way through a cursory survey of the hospital's dumpsters, or it can be a well-planned, elaborate process using both in-house and consulting staff. Re-

Hospitals produce approximately 2 million tons of waste per year.

Figure 1. Hospital waste has doubled since the 1960's.



Source: Environmental Working Group. Data provided for the state of Michigan in: Michigan Health and Hospital Association. 1996.

The second way that hospitals can reduce waste is by replacing disposable supplies with reusable ones.

Regardless, the goal of a waste audit is to learn what types of trash are being generated and how much of it comes from different parts of the hospital.

One of the largest sources of trash in the hospital stream is of a very ordinary type: cardboard and paperboard packaging (Bisson 1993). Most of this material is not even used in the hospital itself, it is simply thrown into the trash when hospital staff remove the contents. The best way for hospitals to reduce the amount of packaging in their waste stream is to design a procurement program with their vendors that gives preference to products with a minimum

amount of packaging. This could include simple steps like requiring vendors to take back wooden shipping pallets or more complicated efforts like working with manufacturers to find new ways to package their products (Bisson 1993).

The second way that hospitals can reduce waste is by replacing disposable supplies with reusable ones. Many hospitals switched from reusable products to disposables in the 70's and 80's because they felt that the disposables were cheaper and more convenient to use. As a result, plastic now constitutes approximately 15-20% of the hospital waste stream, up to 12

Table 4. Many disposable products in common use have reusable alternatives.

Disposable Item	Reusable Alternative
Underpads/chux	Reusable underpads
Eggcrate mattresses	Mattresses with built-in eggcrates
Single use disposable Ambu bags	Reusable Ambu bags
Single use ventilator circuits	Reusable ventilator circuits
Single use disposable gowns	Reusable cloth gowns
Single use dishware	Reusable dishware, both crockery and cutlery
Disposable diapers	Reusable diapers
Sharps containers	Reusable sharps containers
Single use cardboard packaging	Reusable tubs for packaging medical waste
Single use envelopes	Reusable inter-office mailers
Single use disposable pillows	Reusable pillows
Single use disposable bedpans	Reusable plastic or steel bedpans, or dissolvable paper bed pans
Single use urinals	Reusable plastic, steel or dissolvable urinals
Single use emesis basins	Reusable plastic or steel emesis basins
Single use wash basins	Reusable plastic or steel wash basins
Single use bowls	Reusable plastic or steel bowls
Single use anti-embolytic products	Reusable anti-embolytic products
Disposable alkaline batteries	Rechargeable batteries
Disposable wash cloths	Reusable cloth wash cloths
Disposable pitchers & cups	Reusable pitchers and cups

Source: *Health Care Without Harm*.

GIVING BACK TO THE COMMUNITY: DOMINICAN SANTA CRUZ HOSPITAL

Catholic Healthcare West (CHW) is the largest non-profit health care network in the western United States and is a leader in environmental stewardship. One of CHW's hospitals, Dominican Santa Cruz Hospital in California, has a unique reuse and recycling program that simultaneously reduces waste and gives back to the community. The program takes used but clean supplies and, rather than throwing them out, distributes them to the community in their "DominAgain" store. Surgical drapes that would have been landfilled become tarps for painters, nine-volt batteries from heart monitors go into children's toys, brushes that surgeons use to scrub are used by cooks to clean vegetables, and small specimen jars

become paint canisters in local schools. The store either gives away the materials or exchanges them for small donations. The store's proceeds are used to fund programs for the homeless.

The community benefits from the DominAgain program through a cleaner environment and free supplies. The hospital benefits because of the good public relations and because they save money in disposal costs. According to Sister Mary Ellen Leciejewski, the program's founder, Dominican Hospital now saves \$40,000 per year on solid waste disposal costs because some of the hospital's wastes are now being reused in the community.

Source: Dominican Santa Cruz Hospital
Contact: Sister Mary Ellen Leciejewski, 408-462-7674

million pounds of trash per year (American Plastics Council 1994). Some facilities have discovered that the supposed benefits of disposables are overshadowed by the costs of disposal and have switched back to reusable goods. Disposable products that can easily be replaced with durable ones include tableware, mattress covers, and hospital gowns (Table 4).

Of all the hospitals that responded to our survey, 76 percent said that their facility had performed a waste audit in the past three years. This is an en-

couraging statistic considering the fact that waste segregation is the cornerstone of both waste reduction and the avoidance of incineration. Nearly 60 percent have joined the recent trend toward waste reduction through purchasing policies that give preference to reusable goods over disposables and 48 percent have packaging reduction programs.

Recycle

From school buildings to factories, large facilities all across the country have discovered that

Table 5. U.S. hospitals recycle some items much more than others.

Group	Item	Percentage of Hospitals that Recycle
Batteries	Ni-Cad	56%
Batteries	Lead Acid	54%
Batteries	Alkaline	48%
Batteries	Mercuric Oxide	40%
Batteries	Lithium	40%
Batteries	Zinc Air	32%
Batteries	Dry Cell	28%
Batteries	Others	16%
General	White Office Paper	88%
General	Mixed Office Paper	84%
General	Corrugated Cardboard	82%
General	Aluminum	52%
General	Glass	44%
General	Newspaper	40%
General	Magazines	38%
General	Boxboard	36%
General	Junk Mail	36%
General	Books	32%
General	Steel Cans	28%
Misc.	Silver	76%
Misc.	Toner Cartridges	62%
Misc.	Xylene	56%
Misc.	Fluorescent Lights	44%
Misc.	Formalin	32%
Misc.	Overhead Transparency Film	10%
Plastics	#7 Mixed	18%
Plastics	#1 PET	16%
Plastics	#2 HDPE	10%
Plastics	#3 PVC	8%
Plastics	#5 PP	6%
Plastics	#6 PS	6%
Plastics	#4 LDPE	4%

Source: Environmental Working Group.

recycling trash can simultaneously reduce disposal costs and raise staff morale. Some hospitals have followed this trend and even expanded it beyond baseline recycling; they saved quite a bit of money in the process (See Sidebar). These hospitals have found that their recycling programs have helped to build strong bonds of trust between their facilities and the surrounding communities.

It is important to note that recycling waste only attacks one side of the problem. To be truly responsible, hospitals should also tailor their purchasing programs to favor recycled and chlorine bleach free products over virgin, bleached ones. Not only does this help reduce the amount of pollution generated to create these products but buying recycled also helps to stimulate the market for the hospital's trash.

Recycling rates varied greatly among the hospitals that responded to our survey. The total number of items recycled per hospital ranged from 0 to 31 items with an average of 12. Nearly every hospital recycled white and mixed paper; however, very few recycled plastic (Table 5). Fewer than two-thirds of the hospitals recycled toner cartridges, which is surprising since manufacturers usually pay customers to return the empty cartridges. On the chemical side, 76 percent recycled silver, 32 percent recycled formalin, and 56 percent recycled xylene.

RECYCLING PROGRAM: ALBANY MEDICAL CENTER

Hospitals have participated in the increased rate of recycling that the United States has achieved in the past few decades. The Albany Medical Center (AMC), a 500 bed research hospital in upstate New York, has a unique program that takes recycling to the next level.

After years of community pressure to close their medical waste incinerator, and in anticipation of increased regulation of medical waste by the State of New York, AMC developed a comprehensive waste reduction, treatment, and recycling program. This program, called CURE Waste, recycles nearly every item on Health Care Without Harm's list, including all types of batteries and chemicals. The program recycled 16 million pounds of waste and saved the hospital \$4 million in its first six years and the facility is now recycling 43 percent of its total wastestream.

AMC is able to recycle five different types of waste chemicals into usable products through the use of a \$75,000 chemical distillery it built in 1995. The distillation center can convert waste alcohol, formalin,

xylene, mineral spirits, and paint into pure products that the Center can use in its labs. AMC expects the distillery to reduce its hazardous waste chemical production from 29 tons to 6 tons and save \$250,000 per year in disposal and chemical purchasing costs. The facility recycled over 46,000 pounds of alcohol, 25,000 pounds of xylene, 13,000 pounds of formalin, and nearly 3,000 pounds of paint thinner between November 1995 and December 1997.

AMC also saves large amounts of money through its battery recycling program. This program, which began in 1994, keeps harmful toxics like lead and cadmium out of the environment and saves the Center over \$16,000 in hazardous waste disposal costs. The Center's environmental health staff recycle everything from small AAA batteries to large lead-acid 12-volt batteries from fork lifts. The batteries are collected in small buckets and then stored on-site in 30 gallon plastic barrels until they are transferred off-site. The program recycles 15 barrels worth of batteries each year.

Source: Albany Medical Center

Contact: Russell Mankes, Ph.D., Albany Medical Center: 518-262-5490

Albany Medical Center, one of the few facilities that recycles all of these chemicals, has built a distillation center to purify their waste chemicals and sends the purified chemicals back to its labs.

On the other end of the recycling loop, purchasing, the hospitals surveyed did not do much better. Only 10 percent of the hospitals have purchasing poli-

cies that favor unbleached office paper with a recycled content of 20 percent or greater. Over half (60 percent) do not have any purchasing policies when it comes to office paper. Only 8 percent of the hospitals have purchasing policies that promote the use of all or almost all of the following unbleached products: sanitary napkins, napkins, paper towels, and toilet paper.

MANAGING THE HOSPITAL ENVIRONMENT: THE NEW ENGLAND MEDICAL CENTER HOSPITAL

It is the New England Medical Center's (NEMCH) policy to protect employees, faculty, patients, and the public from injury, fire or exposure to hazardous materials, and to prevent damage to property and the environment. NEMCH developed a comprehensive Waste Management Program to outline the measures necessary to keep employee exposure to hazardous substances below levels that would cause health problems, and to ensure compliance with OSHA's and RCRA requirements for waste management and disposal.

In addition, NEMCH has committed to recycling as many end products as possible to support re-use and recycling and to attempt to limit and control potential harm to the environment or the community from its waste materials.

NEMCH treats all medical waste on-site in a centralized autoclave facility prior to its leaving the facility. Approximately 157,000 pounds of medical waste is treated on-site per month. Medical waste autoclaved on-

site results in substantial savings to the facility. The industry average for medical waste disposal is between \$0.18 to 0.24/lbs. as compared to NEMCH's on-site disposal cost of \$0.065/lbs. Labor costs are equal (it takes the same amount of employees to package and disposed medical waste off-site as to treat it on-site).

NEMCH sends trace contaminated cytotoxic (Chemotherapy) waste and pathological waste off-site for incineration in a commercial unit with pollution control equipment.

BioSystems Sharps Disposal System

NEMCH ships 23,808 (3.5) gallon containers and 5,636 (8) gallon containers to BioSystems per year. This represents 19,262 cubic feet of sharps (needle) waste per year. This waste stream includes sharps, needles and syringes, Pasteur pipettes, medical glassware, scissors, (items capable of causing physical harm or punctures).

Sharps containers are transported off site to BioSystems located in Farmingdale, NY where the containers are mechanically opened and the contents placed in autoclave bins. The waste is autoclaved and then ground (crushed) prior to disposal in an approved sanitary landfill. The sharps containers are disinfected, re-assembled and shipped back to us for re-use.

This method of treatment has substantially reduced the amount of plastics in the waste stream and has eliminated the need to purchase new needle containers because the containers are cleaned and disinfected for re-use (Recycling) by BioSystems.

Hazardous Chemicals

NEMCH is a large generator of hazardous waste. Approximately 16 (55) gallon drums of hazardous waste are shipped off-site for disposal at a licensed EPA treatment facility each month.

Combining waste into large containers for disposal is less expensive than disposing of small lab packs. Average cost to dispose of a bulk 55 gallon drum of hazardous waste is \$150 to \$250 per drum as compared to a lab pack at \$275 to \$350 per drum.

Distillation of Hazardous Waste for Re-Use

Xylene distillation allows NEMCH to collect, distill and then re-use the product in its laboratories. Approximately 12 percent of the product is lost in the process. Distillation meets the definition of waste minimization and eliminates the need to dispose of all but 5 percent of the xylene as a hazardous waste. Distillation also reduces the cost of buying new product by 88 percent. The distillation unit saves approximately \$16,000 per year on this one waste stream. Labor costs are equal (it takes approximately the same amount of time to collect, pour and return the container as it does to collect, distill and return the product.) We hope to expand the recycling program to include ethanol and formalin this year.

The New England Medical Center requires all departments and employees to comply with this program.

Source: Michele Plante, New England Medical Center, 617-636-5024

Conclusions

The Health Care Without Harm environmental practices survey—the first of its kind—shows that some of the top hospitals in the country have begun to take environmental stewardship seriously. Many have closed their incinerators and moved toward safer methods of waste disposal in response to changes in the law and community pressure. This is an encouraging development, as are the resolutions that health care associations and hospitals have passed regarding the elimination of PVC and mercury from their

facilities. In spite of these promises, many hospitals still purchase mercury containing products and nearly all buy large amounts of PVC. Worse, there is reason to believe that hospitals either not included in or not responding to the survey may have even worse environmental records.

Even at the nation's leading hospitals, much more progress is needed to translate the new wave of environmentally sound policies into environmentally sound purchasing, waste reduction, and waste disposal practices.

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Sample Survey

Environmental Practices and Policies

Name of Hospital _____

Please complete each question by circling the correct answer.

Thank you very much for your cooperation.

Waste Management Practices

1. What is your hospital's current method for the treatment and disposal of regulated medical waste?

On Site:}

A.) Autoclave

B.) Incineration

C.) Other (please explain)

Off Site:}

A.) Autoclave

B.) Incineration

C.) Other (please explain) _____

Combination:}

A.) Onsite: _____

B.) Offsite: _____

If your hospital uses incineration as a waste disposal method, do you also burn unregulated waste?

A.) Yes

B.) No

2. In light of the new medical waste incinerator regulations (August 1997) are you in the process of re-evaluating how to handle your hospital's regulated medical waste?

A.) Yes

B.) No

If yes, what options are you considering?

- A.)Upgrading incinerator with new pollution controls
- B.)Shutting down incinerator
- C.)Contracting for off site services
- D.)Exploring alternative technologies for on site treatment and disposal
- E.)Other (please explain) _____

3.Has your hospital done a waste audit in the last three years?

- A.)Yes
- B.)No

4. Please circle the items your hospital currently collects for recycling.

- A.)White office paper
- B.)Mixed office paper
- C.)Corrugated cardboard
- D.)Boxboard
- E.)Newspaper
- F.)Magazines
- G.)Books
- H.)Junk Mail
- I.)Aluminum
- J.)Steel Cans
- K.)Glass

L.)Plastics (circle types

- #1 PET
- #2 HDPE
- #3 PVC
- #4 LDPE
- #5 PP
- #6 PS
- #7 Mixed

M.)Batteries (circle types that are recycled)

- 1.)Ni\ _cad
- 2.)Mercuric oxide
- 3.)Alkaline
- 4.)Lead acid
- 5.)Zinc air
- 6.)Lithium
- 7.)Dry cell
- 8.)Others

N.)Toner cartridges

O.)Overhead transparency film

- P.)Fluorescent lights
- Q.)Silver (x-ray film and solution)
- R.)Formalin
- S.)Xylene

Procurement Practices

- 5. Does your hospital have a program in place to eliminate the use of mercury containing products?
 - A.)Yes
 - B.)No

- 6. Does your hospital require a disclosure by your vendors of mercury concentrations in chemicals/reagents?
 - A.)Yes
 - B.)No
 - C.)In certain areas only (e.g. Lab/Pharmacy)

- 7. Have your sewer drain traps or catch basins been cleaned to remove mercury?
 - A.)Yes
 - B.)No

Chlorinated Products

- 8. Does your facility have a procurement policy that promotes a reduction of PVC (#3) plastic products?
 - A.)Yes
 - B.)No

- 9. Does your facility have a procurement policy that promotes a reduction of (#3) PVC packaging and containers?
 - A.)Yes
 - B.)No

- 10. Does your hospital purchase mercury-containing:

Patient thermometers?	yes	no
Blood pressure monitoring devices?	yes	no
Gastrointestinal diagnostic equipment?	yes	no
Thermometers (lab use)?	yes	no
Fixatives(B5, Zenkers, or other)?	yes	no

- 11. Does your hospital have a program in place to reduce PVC (#3) plastic packaging and containers?
 - A.)Yes
 - B.)No

12. Does your hospital have a program in place to minimize the purchasing of PVC (#3) products?

- A.)Yes
- B.)No

13. Does your hospital use PVC (#3) plastic IV bags?

- A.)Yes
- B.)No
- C.)Unsure

If unsure, does your hospital use any of the following intravenous solution bags?

- A.)Abbott
- B.)Baxter
- C.)McGaw

14. Does your hospital have guidelines that specify a purchasing preference for products in minimal packaging or in packaging that is recyclable or made from recycled materials?

- A.)Yes
- B.)No

15. Does your hospital have a policy that promotes the use of reusable products rather than single use, disposable products where feasible?

- A.)Yes
- B.)No

16. Does your hospital have a policy that promotes the of office paper that is

- A.)Chlorine-free?
- B.)Greater than 20% recycled content?
- C.)Both?
- D.)Neither ?

17. Does your hospital have a policy that promotes the purchasing of unbleached, processed chlorine-free or totally chlorine-free sanitary napkins,napkins, paper towels and toilet paper?

- A.)Yes, for three or four of the products
- B.)Yes, for one or two of the products
- C.)No

Employee Education

18.Are staff members given annual training on the health and environmental effects of mercury?

- A.)Yes
- B.)No
- C.)Included in hazard communication program

19. Does your hospital provide employee training on how to properly clean up a mercury spill?

- A.)Yes
- B.)No
- C.)Only to designated personnel

20. Does your hospital provide annual education on waste management for employees?

- A.)Yes
- B.)No

If yes, does that education include information on waste segregation including proper identification and disposal of red bagged or infectious waste?

- A.)Yes
- B.)No

Community Health

21. Have your hospital's sewer traps or catch basins ever been cleaned to remove mercury?

- A.)Yes
- B.)No

22. Does your hospital distribute mercury containing thermometers to new parents as a take-home item?

- A.)Yes
- B.)No

Thank you for completing this survey. Please return it in the attached postage paid envelope to Health Care Without Harm c/o Center for Health, Environment and Justice P.O. Box 6806, Falls Church VA 22040 or by faxing it to 703-237-8389.

Health Care Without Harm will send you copies of its report on the environmental practices of the nation's best hospitals as soon as it is completed this spring.

Cecilia DeLoach, Citizens Clearinghouse for Hazardous Waste

Health Care Without Harm Member Organizations

(as of June 4, 1998):

1199, the National Health & Human Service Employees Union, New York NY
Action for Women's Health, Albuquerque, NM
American Federation of Labor - Congress of Industry Organizations(AFL-CIO), Washington, DC
American Nurses Association
Beth Israel Health Care System, New York, NY
Breast Cancer Action, San Francisco, CA
California Nurses Association, Sacramento, CA
California Communities Against Toxics, Rosamond, CA
California Nurses Association, Sacramento, CA
California, Nevada Board of Church & Society, United Methodist Church, Santa Cruz, CA
Cathedral of Saint John the Divine, New York, NY
Catholic Healthcare West, San Francisco, CA
Center for the Biology of Natural Systems, Flushing, NY
Center for Environmental Health, San Francisco, CA
Center for Health, Environment & Justice, Falls Church, VA
Centre national d'information indépendante sur les déchets (CNIID), Paris, France
CGH Environmental Services, Burlington, VT
Chemical Impact Project, Kentfield, CA
Citizens Environmental Coalition, Albany, NY
Citizens for a Better Environment, Chicago, IL and Madison, WI
Clean North, Sault St. Marie, Ontario Canada
Committee of Interns and Residents, New York, NY
Commonweal, Bolinas, CA
Department of Environmental Health, Boston University School of Public Health, Boston, MA
DES Cancer Network, Washington, DC
Earth Day Coalition, Cleveland, OH
EarthSave
Ecology Center of Ann Arbor, Ann Arbor, MI
Endometriosis Association, Milwaukee, WI
Environmental Association for Great Lakes Education, Duluth, MN
Environmental Stewardship Concepts, Richmond, VA
Environmental Working Group, Washington, DC
Essential Action, Washington, DC
Farm-Verified Organic, Medina, ND
Fletcher Allen Health Care, Burlington, VT
Galveston-Houston Association for Smog Prevention, Houston, TX
General Board of Church & Society, United Methodist Church, Washington, DC

Government Purchasing Project, Washington, DC
Great Lakes Natural Resource Center of the National Wildlife Federation, Ann Arbor, MI
Greenpeace
Hamtramck Environmental Action Team, Hamtramck, MI
Human Action Community Organization, Harvey, IL
Indigenous Environmental Network, Bemidji, MN
Institute for Agriculture & Trade Policy, Minneapolis, MN
Jenifer Altman Foundation, Bolinas, CA
Judith Helfand Productions, New York, NY
Kirschenmann Family Farms, Windsor, ND
Learning Disabilities Association, Pittsburgh, PA
Legal Environmental Assistance Foundation, Tallahassee, FL
Massachusetts Breast Cancer Coalition, Waltham, MA
Minnesota Center for Environmental Advocacy, St. Paul, MN
Mount Sinai School of Medicine, New York, NY
Multinationals Resource Center, Washington, DC
National Environmental Law Center, Boston, MA
National Women's Health Network, Moretown, VT
New York State Nurses Association, Latham, NY
North Carolina Waste Awareness & Reduction Network, Durham, NC
North Carolina Breast Cancer Coalition
Ohio Network for the Chemically Injured, Parma, OH
Oil, Chemical and Atomic Workers Union
Oncology Nursing Society
Oregon Center for Environmental Health, Portland, OR
Physicians for Social Responsibility
Pollution Probe, Toronto, Ontario Canada
Reconstructionist Rabbinical Association
Reduce Recidivism by Industrial Development, Inc., Chicago, IL
Save Our County, E. Liverpool, OH
Science & Environmental Health Network, Windsor, ND
Sierra Club
South Bronx Clean Air Coalition, Bronx, NY
South Carolina Nurses Association, Columbia, SC
Srishti, New Delhi, India
The Breast Cancer Fund, San Francisco, CA
Toxics Action Center, Boston, MA
United Citizens and Neighbors, Champaign, IL
Vermont Public Interest Research Group, Montpelier, VT
Vietnam Veterans of America — Michigan Chapter, Saline, MI
Washington Toxics Coalition, Seattle, WA
White Lung Association, Baltimore, MD
Women's Cancer Resource Center, Berkeley, CA
Women's Cancer Resource Center, Minneapolis, MN
Women's Community Cancer Project, Cambridge, MA
Women's Environment and Development Organization, New York, NY
Work on Waste, Canton, NY

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